Farm and Farmers Specific Characteristics and Analysis of Farmers' Farm Revenue and Cost Returns among Rural Farmers in Biu Plateau Region of Borno State, Nigeria

Joel Mari Bwala [1], Usman Hyeladi Mshelizah[2], Bulama Samson Mshelia[3] Luka yohanna[4]

[1]Department of Geography University of Maiduguri, Maiduguri.
[2]Federal College of Freshwater Fisheries Technolgy, Baga, Borno State
[3]National Open University of Nigeria, Azare Community Study Centre, Bauchi State
[4] Department of Geography Modibbo Adama University of Technology, Yola.

Abstract- A socio-economic survey of rural farmers in Biu Plateau Region of Borno State, Nigeria was conducted in 2018 to study the characteristics of the farmers in order to proffer solutions that can improve their productivity. A structured questionnaire containing over 90 questions were designed and administered to a randomly selected 385 farmers determined from Krejcie and Morgan (1970) sampling table proportionately to the population of each of the selected settlements in the five local government areas that made-up of the region. Data were analyzed using relevant descriptive statistics. The average age of the farmers was found to be 46.13 and male dominated the farming population (77.1%). It was found that, land ownership arrangement was predominantly (58.2%) through inheritance. Majority (50.9%) of the respondents had farming experience of 11-20 years. Only 10% of the respondents used at least 5 hectares of land for their crop production. Majority (97.4%) of the respondents had no access to formal source of credit. The total revenue generated from the sales of the produce by all farmers amounted to the sum of N 101,369,390.00k. On an average, each of the farmers made a profit of N168, 438.98k in the 2018 farming year. For the income of the farmers in the countryside to be improved, the local councils should educate rural farmers on extension services for sustainable farming and best practices. Additionally, critical rural infrastructure, such as water and electricity should be provided at affordable rates. Arguably, this could not only improve farmers' earnings, but also make the communities attractive to the rural farmers and young people, and stabilize rural populations.

Index Terms- Farm, Farmers, Specific Characteristics, Revenue, Cost Returns, Rural

I. INTRODUCTION

The role of agriculture in developing countries like Nigeria is significantly and unarguably massive in not only contributing to the economic growth but in also in feeding her teeming population. Agriculture is therefore considered as the bedrock of the economy in Africa having employed about 70% of the workforce and generates, on average, 30 percent of the region's Gross domestic product (GDP) (Economic Commission for Africa (ECA), 2007). There is a case of an untapped potential in the sector, that is, to increase individual farmers' yield per area of land cultivated consequently and ensure food self-sufficiency and security.

Socio-economic characteristics of farmers in any community affect their productivity and income (Cathy-Austin & Nahanga, 2017). Where such information and the limitations exist, solutions that can help improve their productivity can be proffered. The fundamental objective of agriculture is to ensure food security in a nation so that households and society have access to good nutritious food for healthy living (Asadu, Agbo, Asadu & Onyeme, 2019). National food security is defined as the ability of a country to produce sufficient food all year round to meet her food requirements both in quantity and quality (FMARD, 2016). Most agrarian societies in northeastern Nigeria are populated by small-scale farmers (Tsue, 2015). Generally when the farm holding of a farmer is less than 10 hectares the farmer is regarded as a small scale farmer (Consultative Group to Assist the Poor (CGAP), 2017). More than 80% of farmers in Nigeria are small scale farmers and they are the major contributor to Nigeria's Gross Domestic Product (GDP) (World Bank, 2018). Small-holder farming system in Nigeria is usually a mixed farming system involving the growing of crops and rearing of animals and/or mixed cropping in various ways (FAO, 2016).

This practice is commonly widespread in northern Nigeria. Asadu, Agbo, Asadu & Onyeme, 2019 asserted that the major advantages of small-scale farmers are possession of own labour and land; insurance against total crop failure due to pest and disease and regular food supply for family use and cash. It is estimated that about 75% (68 million hectares) of Nigeria's total land area of about 923,769 km^2 has the potential for agricultural activities with about 33 million hectares under cultivation (Federal Ministry of Agriculture and Water Resources, 2008; Abdulazeez, 2011). Yet half of this agricultural land has not been used to produce crops and livestock to reduce the threat of hunger and poverty through effective production system (Mgbenka & Mbah, 2016). Recent statistics shows that the contribution of agriculture to the GDP in Nigeria is 24.18 %, to non-oil exports earnings is 75

% and 70% of the labour force is in agriculture but agriculture's share of Federal budget is ≈2.0 % only (FMARD, 2016; Emefiele, 2017). This is against Maputo Declaration that prescribed a minimum of 10% budgetary allocation to the agricultural sector (FMARD, 2016). The major constraints on agricultural production are often related with inadequate information on soil characteristics, climate variability, available technology and socioeconomic data including market access (Asadu & Nweke, 1999).

The communities selected for this study are in rural communities of Biu Plateau Region of Borno State known for farming activities. The objective of this study was to obtain an update of the current farmers' farm specific socio-economic characteristics as well as constraints on agriculture in order to proffer solutions so as to encourage the farmers, governments and interested non organizations to invest in agriculture in the areas in order to enhance the income of the farmers and their livelihood.

II.   MATERIALS AND METHODS

Study Area

This research was conducted in Biu Plateau Region of Borno State, Nigeria. On account of topography, Biu plateau region can be regarded as a distinctive region (Bwala 2011). As such the study covers the areas of the main plateau and its surrounding plains. Administratively, Bayo, Biu, Hawul, Kwaya-Kusar and Shani Local Government Areas which constitute the former Biu Division were used for this study.   The region lies between latitudes 10^0 and 11^0 30^1 N of the Equator and longitudes 11^0 39^1 and 12^0 40^1 E of the Greenwich Meridian and it is located in the Guinea savanna belt of Nigeria. The region covers a total area of 8, 641km^2 with a population of 533,264 persons and a population density of 61 persons per square Kilometer (National population Commission, 2006). The Biu Plateau region is bounded to the east and south by Adamawa State, to the West by Gombe State while the northern region is bounded by Yobe State, Damboa and Chibok Local Government Areas of Borno State. The major ethnic groups that co-exist in the area are Bura and Pabir. Occupationally, a base line socio-economic survey conducted by Amaza, Olayemi, Adajibi, Bila and Iheanacho, (2007), revealed that farming is the main stay of the population economy and most people are subsistence farmers. Agriculture employs the larger percentage of the working population (78%) in the area, but agricultural landholdings are generally small.

Types and Sources of Data

The data used for this research were generated on different farmers' specific socio-economic characteristics, land tenure types and expenditures on farm inputs and income from sales (output). Data were collected mainly from primary sources through a well structured questionnaires administered to a sample of 385 respondents determined by Krejcie and Morgan (1970) sampling table using the estimated population of the study area as at 2016. The questionnaires were administered in the sampled settlements proportionately to the population of the sample settlements as shown in Table 1 and the respondents were finally selected randomly from each of the selected communities.

Table 1: Population, number of Sample Settlements and Sample Size for the Study

LGA	Population (2016) projected	Number of settlements	Sample settlements	Sample size	Percentage
Bayo	109308	61	6	57	14.8
Biu	242931	83	8	127	33.0
Hawul	166639	135	14	87	22.6
Kwaya-Kusar	78370	65	7	41	10.6
Shani	139582	118	12	73	19.0
Total	736825	462	47	385	100.0

Source: NPC (2006)

Data Analysis

The data collected were collated and analyzed using descriptive statistics like means, frequencies and tables and charts. While for the farmer's farm costs and returns analysis the formula NR = TR – TVC was used.
Where
NR = Net Returns,
TR = Total Revenue and
TVC = Total Variable Cost

III.   RESULTS AND DISCUSSIONS

Bio-Data of the Respondents
The bio-data of the respondents are presented in Table 2

Table 2: Bio-data and Socio-economic characteristics of the Respondents

Variables	Frequency	Percentage	Mean
Age (Years)			46.13(8.42)
≤20	1	.3	
21-40	91	23.6	
41-60	273	70.9	
>60	20	5.2	
Gender			
Male	297	77.1	
Female	88	22.9	
Marital Status			
Single	89	23.1	
Married	266	69.1	
Widowed	25	6.5	
Separated	5	1.3	
Household Size			6.54(2.44)
≤5	137	35.6	
6-10	228	59.2	
11-15	14	3.6	
>15	6	1.6	
Educational Qualification(years)			2.83(1.23)
Non-formal(0)	66	17.1	
Primary(1-6)	94	24.4	
Secondary(7-12)	100	26.0	
ND/NCE(13-15)	86	22.3	
Degree or Equivalent(>15)	39	10.1	

*Values in parentheses represent standard deviation
Source: Computed from field survey data, 2018

Results in Table 2 revealed that majority (70.9%) of the respondents were within the age group of 41-60 years. On the average, the age of the respondents was 46 years. This implied that the farmers were still within the active and economic age bracket of 21- 60 years. The result agreed with the findings of Iorlamen, Abu & Lawal (2013) and Tsue (2015) who found that the mean age of farmers in Nigeria was between 45-48 years. On the contrary, the result is in disagreement with the finding of Simon (2015) who asserted that the average age of arable farmers in Ghana is between 35-40 years.

Analyses of sex of household heads showed that, majority (77.1%) of the respondents in Biu Plateau Region of Borno State, Nigeria were males while the remaining 22.9% were females. The result implied that arable farming in the study area is still primarily male dominated. This could be due to the cultural and religious background of most African communities that still put women's enterprise under their husbands' care as a form of submission. This supports the earlier survey result of (Bamire, 2010) on the effects of tenure and land use factors on food security among rural households in the dry savannas of Nigeria, where majority (92.5%) of the respondents were males.

The results of marital status showed that 69.1% of the respondents were married. This implied that a high proportion of respondents had family responsibilities. The size of the arable farmers' household showed that majority (59.2%) had household size of six to ten people with the average household size of six people. Large family size is assumed to be the source of labour, skills and strong social capital to adapt to changing situations. However, if only a few members of the household are engaged in productive livelihood activities that can support the family, large household size could be a burden to the family where most of the members are of school age.

The result on the level of education indicated that, 82.8% of them had formal education at varying levels. The remaining 17.2% have non-formal education. On the average, years of educational attainment of the respondents were 2.8. The result implied that arable farmers attempted secondary education and or its equivalent. This result suggested that most of the rural arable farmers could read and write in English language as it is observed among their counterpart in Ghana Simon (2015).

Land Ownership Arrangement
Land ownership arrangements indentified in the study area are shown in Figure 1
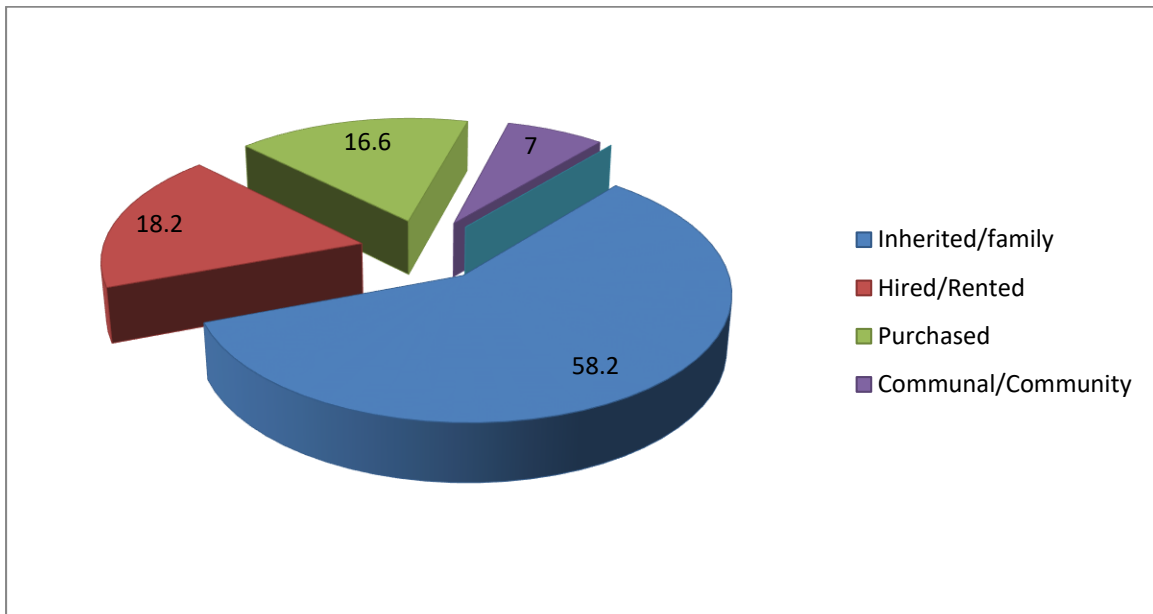
Figure 1: Types of Land Ownership
Source: Computed from field survey data, 2018

The study showed that land ownership arrangement was predominantly (58.2%) through inheritance. The hired/ rent tenure type accounted for 18.2% of the respondents while 16.6% of them purchased their land. The remaining 7.0% of the respondents indicated using communal land tenure system. This implied that private ownership (inheritance and purchase) of arable land was most predominant in the study area. This could enhance credit access and investment on land. However, in this study, farmers indicated having limited access to credit despite the high private ownership of land. This is likely the case when such rights are not secured by land title registration.

Farm and Farmers-Specific Characteristics in Biu Plateau Region of Borno State, Nigeria

The farmers specific characteristics of arable farmers in the study area considered are farming experience, annual farm income, off-farm employment, off-farm income and access to formal credit among others. These farmers' farm characteristics are presented in Table 3 and Table 3

Table 3: Farm and Farmers-Specific Characteristics of the Respondents

Variables	Frequency	Percentage	Mean
Farming Experience			16.79 (8.53)
≤10	97	25.2	
11-20	196	50.9	
21-30	63	16.4	
>30	29	7.7	
Source of Labour			
Family Labour	214	55.6	
Hired Labour	52	13.5	
Both	119	30.9	
Farm Size (ha)			5.73(3.56)
<2	130	33.8	
2-4	172	44.7	
>4-5	45	11.7	
>5	38	9.9	
Annual Farm Income (N)			241499.4 (210410.8)
≤100,000	26	6.8	
100,001-200,000	183	47.5	
200,001-300,000	114	29.6	
>300,000	62	16.1	
Off-Farm Employment			
Engaged	163	42.3	

Not Engaged	222	57.7	
Off-Farm Income (N)			21255.1 (233933.7)
<100,000	56	14.5	
100,000-200,000	78	20.3	
200,001-300,000	35	9.1	
>300,000	29	7.5	
No Response (NR)	187	48.6	
Indigene ship			
Indigene	278	72.2	
Non-Indigene	107	27.8	
Access to Formal Credit			
Have access	10	2.6	
No access	375	97.4	

*Values in parentheses represent standard deviation
Source: Computed from field survey data, 2018

Table 3: Farm and Farmers-Specific Characteristics of the Respondents (cont.)

Variables	Frequency	Percentage	Mean
Collection of credit (2017)			
Collected	2	.5	
Not collected	383	99.5	
Credit amount collected (2017) (N)			60000(56568.5)
<100000.00 (20000.00)	1	50.0	
>100000.00 (100000.00)	1	50.0	
Interest paid (2017)			10001.50(14140.01)
Contact with extension workers			2.01(.31177)
Have contact	196	50.9	
Have no contact	189	49.1	
Number of contact with extension workers			
<3			
≥3	194	90.0	
Membership of farmer's association	2	1.0	
Member			
Non-Member	11	2.9	
	374	97.1	

*Values in parentheses represent standard deviation
Source: Computed from field survey data, 2018

Majority (50.9%) of the respondents have farming experience of 11-20 years. On the average, the farmers had a farming experience of 16.8 years. This implied that, the respondents were experienced farmers; hence, they had over the years acquired enough farming experience needed to understand farming activities in their communities. The report on the source of farm labour in Table 3 showed that most of the farmers (55.6%) depend on the family labour against hired labour that posted 13.5% of the respondents. This scenario could be attributed to the fact that majority of the respondents do not have other off-farm employment and are mostly low income earners. The remaining respondent (30.9) do used both family and hired labour for their farm operations. These groups of people are mainly the civil servants and people with other off-farm jobs as gathered from the focus group discussion.

Farm size category in the study area indicates that most (44.7%) of the respondents cultivate a farm size of 2-4 hectares of land and 130 respondents representing about 34% used only less than 2 hectares of land for their agricultural production. Only about 10% of the respondents used 5 and more hectares of land for their crop production. Furthermore, the small size of farmland (average of 4.6ha) allocated to crop production in the study area showed that majority of the arable farmers in the study area are small scale farmers. Tsue (1015) found a similar result in North-Central Nigeria. The small farmland size in the study area may not

be unconnected to increase in population in most Nigerian communities.

The study revealed further that 83.9% of the respondents had farm income of N300, 000.00 and below. While the remaining respondents (16.1%), earned above N300, 000.00 per year. On the average, the farm income was N241, 499.00. This amount was relatively high and could enable farmers to demand for technologies that will increase their production and likely improve their standard of living. Majority (57.7%) had non off-farm employment, while the remaining (42.3%) had off-farm engagement. The average income from off-farm engagements is N212, 551: 00 per annum. This showed that farm income was the most important source of income for the farm households. The low engagement in off-farm employment could hinder farmers from owning and operating large farm size and investing in agriculture general.

The residential status of respondents showed that, most (72.2%) were indigenes of the communities they resided and the remaining 27.8% are non indigenes of the communities they resided. This situation could enhance land tenure security through inheritance and consequently an optimal use of natural resources. Access to formal credit by the farmers was generally poor in the study area. The result indicated that majority (97.4%) had no access to formal sources of credit. Only about less than 3% of the respondents have access to formal credit, this condition may likely decrease farmers' efficiency by limiting investment and adoption of new technologies and farming practices and as well as information needed on climate change and increased land productivity.

The average number of extension contacts in a year was 2.01 times. The more the number of contacts farmers had with extension services, the better their skills in the use of land for environmental sustainability.   On the farmer's membership to farmers associations, 97.1% of them did not belong to any farmers' associations. Only 2.9% belong to one form of farmers associations or the other. Social participation enhances farmers' production activities. Successful and enduring local institutions create relationships with a common purpose and promote shared interests, but could also provide emotional and practical support, information and resource sharing, building community members' capital to mitigate and respond to natural and man-made hazards.

Analysis of Farmers' Farm Revenue Cost and Returns

Analysis of the respondents' farm expenditure from labour, seeds, fertilizer, herbicides pesticides, mechanization farm yard manure and fixed cost (input), income from sales (output) and profit are presented in Table 4.

Table 4: Farmers Farm Costs and Returns Analysis

Items	Value (N)	percentage
A. Sales/Revenue (output price)		
Crop Group 1	51,559,550.00	50.9
Crop Group 2	32,545,440.00	32.1
Crop Group 3	11,383,200.00	11.2
Crop Group 4	5,881,200.00	5.8
Total Revenue (TR)	**101,369,390.00**	**100**
B. Variable Costs		
i. Labour	14,860,732.00	40.7
ii. Fertilizer	7,472,778.00	20.5
iii. Seed	3,570,116.00	9.8
iv. Mechanization	1,457,050.00	4.0
v. Herbicides	3,573,715.00	9.8
vi. Pesticides	3,314,109.00	9.0
vii. Manure	320,500.00	0.9
Total Variable Costs (TVC)	**34,569,000.00**	
C. Depreciated Fixed Cost item/season		5.3
i. Plough/ Oxen	56,034.00	
ii. Wheel barrow	379,000.00	
iii. Sprayers	589,486.00	
iv. Water tank	1,064.00	
v. Hoes	697,683.00	
vi. Sickle /Cutlass	94,460.00	
vii. Basins and others	139,430.00	
Total Fixed Cost (TFC)	**1,957,157.00**	
D. Total Cost = (B+C)	**36,526,157.00**	
E. NR = TR-TC (A-(B+C)	**64,843,233.00**	**100**

Source: Computed from field survey data, 2018
Note: -
 A = Total Revenue (TR)   B =Total Variable Cost (TVC),
 C = Total Fixed Cost (TFC)   D = Total Cost (TC),
 E = Net Returns (NR)   Where: - NR (E) = TR (A)-TC (D)

Table 4 shows the analysis of revenue and costs incurred in each crop group produced in the study area. Crop group 1 has the highest revenue of fifty one million, five hundred and fifty nine thousand, five hundred and fifty naira (N51, 559,550.00k); followed by crop group 2, crop group 3 and crop group 4 respectively. The total revenue generated from the sales of all the five crop groups by the respondents amounted to the sum of N101, 369,390.00k with a total cost incurred from all the farm operations to the sum of N36, 526,157k. The total net returns (benefit) of all the crops amounted to N64, 843,233.00k. This indicates that farming in the study area is highly profitable. On an average, each of the farmers makes a profit return of N168, 438.98k in that farming year.

Table 4 further revealed that the highest cost (40.7%) incurred was the cost of labour followed by the cost of fertilizer (20.5%), seeds and herbicides (9.8%) each, pesticides, fixed cost, mechanization and the least cost (0.9%) incurred was from the purchase and use of manure. This implied that cost of labour is high in the study area which may likely be as a result of the use of direct labour rather than the use of mechanized labour. Fertilizer is also one of the farm components that are generally expensive to farmers in Nigeria. Nevertheless, the income and benefit derived by the farmers is considered profitable.

The result of this study conformed to that of Dawang, Seltim & Matawal (2014) on land tenure systems and farmers efficiency and profitability analysis in Plateau State, Nigeria, who found that all the farmers in the study area under different land ownership gained from their farming activities, and that labour made up 47.03% and 50.60% of cost inputs used by farmers of inherited and gift lands respectively and being the highest cost item followed by fertilizer 21.82% and 15.0% as in this study.

IV. SUMMARY AND CONCLUSION

A socio-economic survey of rural farmers in Biu Plateau Region of Borno State, Nigeria was conducted in 2018. The characteristics of the farmers showed that farming population was dominated by male. The average age of the farmers was found to be 46.13. It was found that, land ownership arrangement was predominantly (58.2%) through inheritance. Majority (50.9%) of the respondents had farming experience of 11-20 years. Only 10% of the respondents used at least 5 hectares of land for their crop production. Majority (97.4%) of the respondents had no access to formal source of credit. On an average, each of the farmers made a profit of N168, 438.98k in the 2018 farming year. Very high potentials exist for sustainable agricultural development in all the communities selected. For the income of the farmers in the countryside to be improved, the local councils should educate rural farmers on extension services for sustainable farming and best practices. Additionally, critical rural infrastructure, such as water and electricity should be provided at affordable rates. Arguably, this could not only improve farmers' earnings, but also make the communities attractive to the rural farmers and young people, and stabilize rural populations.

REFERENCES

[1] Abdulazeez, A. (2011). Nigeria can feed the West African sub-region. *Trading Economics.*

[2] Amaza, P. S., Olayemi, J. K., Adejibi, A. O., Bila, Y. & Iheanacho, I. (2007). Base Line Socio-economic Survey Report. Agriculture in Borno State, Nigeria. International Institute of Tropical Agriculture, Ibadan, Nigeria.

[3] Asadu, A. N., Agbo, F. U., Asadu, C. L. A. & Onyeme, E. (2019). Socio-Economic Characteristics of Farmers in five Agrarian Communities in Anambra State, Southeastern Nigeria, *International Journal of Current Research*, 11, (04), 2984-2989.Available online at http://www.journalcra.com

[4] Asadu, C.L.A. and F.I. Nweke. 1999. The soils of cassava growing areas in sub- Saharan Africa.

[5] Bamire, A. S. (2010). Effects of tenure and land use factors on food security among rural households in the dry savannas of Nigeria. *African Journal of Food Agriculture Nutrition and Development, 10 (1), 1982-2000.*

[6] Bwala, A. A. B. (2011). Domestic Water Resources Availability and Utilization in the Biu Plateau Region of Borno State. (Unpublished Ph. D. Thesis). Department of Geography, Federal University of Technology, Yola.

[7] Cathy-Austin O. and Nahanga V. 2017. The socioeconomic characteristics of rural farmers and their net income in Ojo and Badagry local government areas of Lagos state, Nigeria

[8] Consultative Group to Assist the Poor (CGAP). 2017. National Survey and Segmentation of Smallholder Households in Nigeria. Washington, DC.

[9] Economic Commission for Africa (ECA) (2007), Economic Report on Africa 2007: Accelerating Africa's Development through Diversification. Addis Ababa: UN Economic Commission for Africa.

[10] Emefiele, G. (2017). A Central Bank of Nigeria, (CBN) Report for May 2017. CBN, Abuja.

[11] FAO. 2016. Review of the Livestock/Meat and Milk Value Chains and Policy influencing them in Nigeria. Rome.

[12] Federal Ministry of Agriculture and Rural Development (FMARD). 2016. The Agriculture Promotion Policy (2016–2020). Retrieved from http://fmard.gov.ng/wp-   content/uploads/2016/03/2016-Nigeria-Agric-SectorPolicy-Roadmap_June-15-2016_Final.pdf

[13] Federal Ministry of Agriculture and Water Resources. (2008). National Programme for Food Security. Abuja: Author.

[14] Iorlamen, T.R., Abu, G.A. & Lawal, W.L. (2013). Comparative analysis on socio-economic factors between food secure and food insecure households among urban households in Benue State, Nigeria. *Journal of Agricultural Science, 4(2): 63-68.*

[15] Krejcie, R. V. & Morgan, D. W. (1970). Determining sampling size for research activities. Educational and Psychological Measurement 1970, 30, 607- 610

[16] Mgbenka, R. N. and Mbah, E.N. 2016. A review of smallholder farming in Nigeria: need for Transformation. *International Journal of Agricultural Extension and Rural Development Studies, 3 (2): 43-54.*

[17] National population commission. (2006). 2006 national census data for Nigeria. Abuja: Author.

[18] Simon, A. (2015). The effects of land tenure systems and investment on cocoa productivity in Ghana (Unpublished M. Phil. Thesis). Department of Agricultural Economics, Agribusiness and Extension, Kwame Nkrumah University of Science and Technology, Ghana.

[19] Tsue, P. T. (2015). Effects of Arable Land Tenure and Utilization on Environmental Degradation among Small-Scale Farmers in North Central Nigeria. (Unpublished Ph.D. thesis). Department of Agricultural Economics, University of Nigeria, Nsukka.

[20] World Bank. 2018. The World Bank in Nigeria. Washington, DC.

AUTHORS

First Author – Joel Mari Bwala, Department of Geography University of Maiduguri, Maiduguri.

Second Author – Usman Hyeladi Mshelizah, Federal College of Freshwater Fisheries Technolgy, Baga, Borno State

Third Author – Bulama Samson Mshelia, National Open University of Nigeria, Azare Community Study Centre, Bauchi State

Fourth Author – Luka yohanna, Department of Geography Modibbo Adama University of Technology, Yola.